"Crack-Neck": A Non-Parasitic Disease of Chrysanthemums

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Reprinted from PHYTOPATHOLOGY, Vol. IX,
No. 11, November, 1919

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BRIEFER ARTICLE

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WITH PLATE XXXVII

Description. This term is applied to a trouble occurring on fancy forced chrysanthemums raised for exhibition purposes, and to a lesser extent on ordinary potted chrysanthemums not so excessively forced. It is characterized usually by a horizontal rupturing of the stem or "neck" just below the bud or flower head. Occasionally a longitudinal splitting also occurs but this latter condition is rather infrequently found.

The extent of the cracking is variable, sometimes being very slight, at others almost completely girdling the stem or "neck." Often more than one crack may be found on the same stem. Where more are found, one is usually located very close to the bud and the others somewhat lower down on the stem (plate XXXVII) fig. 1, *A* and *B*).

The rupture is often comparatively deep, sometimes extending through all the outer tissues and into the pith. Plate XXXVII, figs. 4 and 5, show a longisection through the ruptured stem, and a cross section of the same stem just below the rupture. It will be noted that in this case the rupture extends through the outer tissues and trachea, but not deep enough to cut all.

Occurrence and extent of injury. This trouble was first noted in the greenhouses of the Massachusetts Agricultural College in October of 1917, and was subsequently observed elsewhere. In 1918, it was again noted in some greenhouses. The injury occurred in all cases just as the plant was ready to bloom. An examination of the plants in the beds showed many which had one or more lesions, the number of plants affected being rather unequally distributed between the different varieties. Those most seriously affected were the Mountain Greenwood, the Yellow Turner, and the White Turner, the first showing about 80 per cent of the plants injured, the last not over 50 per cent. Other varieties showed little or no injury. An interesting feature also noted was that only plants which had been crown budded showed any injury, terminal budded plants in no case showing any signs of lesions, even on those varieties which were apparently the most susceptible.

Cause. It was plainly evident that no organism was connected with the trouble and it appeared to be due to a sudden displacement of the equilibrium normally existing between the temperature and moisture relations and root pressure, so-called. Investigation of the fertilization indicated that an excess of plant food could not be a contributory cause, and the condition of the plants did not indicate the presence of continued excessive soil moisture. All the plants presented a healthy, robust appearance. It was evident that overfeeding and continued excessive watering should be eliminated from consideration.

There are, however, in addition to strictly oedemic conditions, other types of non-parasitic disorders which have been noted by Sorauer[1] and others, in which a rupture of the roots, stems or fruit occurs, due in some cases to a *sudden* excess of water supply, and in others to a rapid lowering of the air temperature accompanied by rain and a consequent high humidity. These latter conditions, as has been repeatedly shown by investigators, result in a very much decreased transpiration. The above-mentioned disorders have been reported not only on vegetables, fruits and herbaceous plants, but on trees, to a lesser degree, as well.

It was believed that a similar set of factors might be responsible for the injury observed on the chrysanthemum, and a careful study of the conditions existing in the house prior to the time the injury was first noted yielded interesting data.

Up to September 29 no injury had been observed on any of the plants. The thirtieth was a dull, overcast day, but the temperature of the house was normal for the plants at that stage of maturity (58°–62° F.). The beds were watered rather late in the afternoon, about 4.00 p.m. A violent rain storm occurred still later in the afternoon, and the air temperature dropped several degrees very rapidly. The house also cooled rapidly. No heat was available during the night and the temperature in the house remained very low, 42° to 44°. The humidity remained rather high during the night. On the other hand the temperature of the soil in the beds did not drop greatly, so far as could be ascertained. It is a well-known fact, however, that the soil responds to changes in air temperature rather slowly, especially when well supplied with water, as was the case here. The following day was also cool and overcast. The next morning several of the plants developed the characteristic cracking.

There existed then the following situation preceding the injury: (1) very little transpiration taking place as a result of the low air temperature and the high humidity, and (2) the soil temperature remaining practically stationary, the soil having been previously well supplied with mois-

[1] Sorauer, Paul. Handbuch der Pflanzenkrankheiten, Band I, pp. 321 and 461.

ture, and the roots functioning normally in so far as the absorption of water and solutes was concerned.

These and similar conditions always bring about abnormal cell relations and, in consequence, an excessive turgor is brought about in some of the cells with no normal means of regulation, such as occurs when the plants are transpiring freely, and as a result some of the tissues must give way to permit of a return to the normal condition.

That the conditions above mentioned are capable of producing a cracking of the necks of chrysanthemums has been shown experimentally by duplicating the conditions in the greenhouse, also by cutting the stems, attaching a tight rubber connection to the cut end, and subjecting the tissues to water pressure. The cracking and splitting produced experimentally are shown in plate XXXVII, figures 2 and 3.

Control measures. It was suggested as a probable means of control that the night temperatures be raised as much as possible, consistent with the best development of the plants, and that during dull weather water be withheld as much as possible, or, in any case, be applied in the morning. These directions were followed, and although considerable cool, cloudy weather followed no further trouble was experienced.

Later many of the lesions calloused over and the blossoms developed, but in every case there was some distortion or unequal development of the blooms, rendering them unsuitable for exhibition or sale.

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PLATE XXXVII

FIG. 1. Chrysanthemums showing natural cracking and splitting of the "neck." *A* and *B*, a double cracking on one "neck."

FIG. 2. Cross cracking experimentally produced.

FIG. 3. Longi-splitting experimentally produced.

FIG. 4. Longisection through a ruptured "neck."

FIG. 5. Cross section of stem just below the rupture.

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